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(56) Documents Cited

EP 0599705 A1 EP 0540001 A1 EP 0395416 A2
EP 0330044 A1 US 5206946 A

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(54) SCSI bus extension over the ethernet

(57) A SCSI bus may be extended beyond typical 10 meter length by transmitting SCSI signals in ethernet packets between local and remote sections of the SCSI bus. Each of the sections of the SCSI bus has a device comprising a SCSI interface module, a network interface module and a processing module with cache RAM which converts SCSI signals into network signals or vice versa.

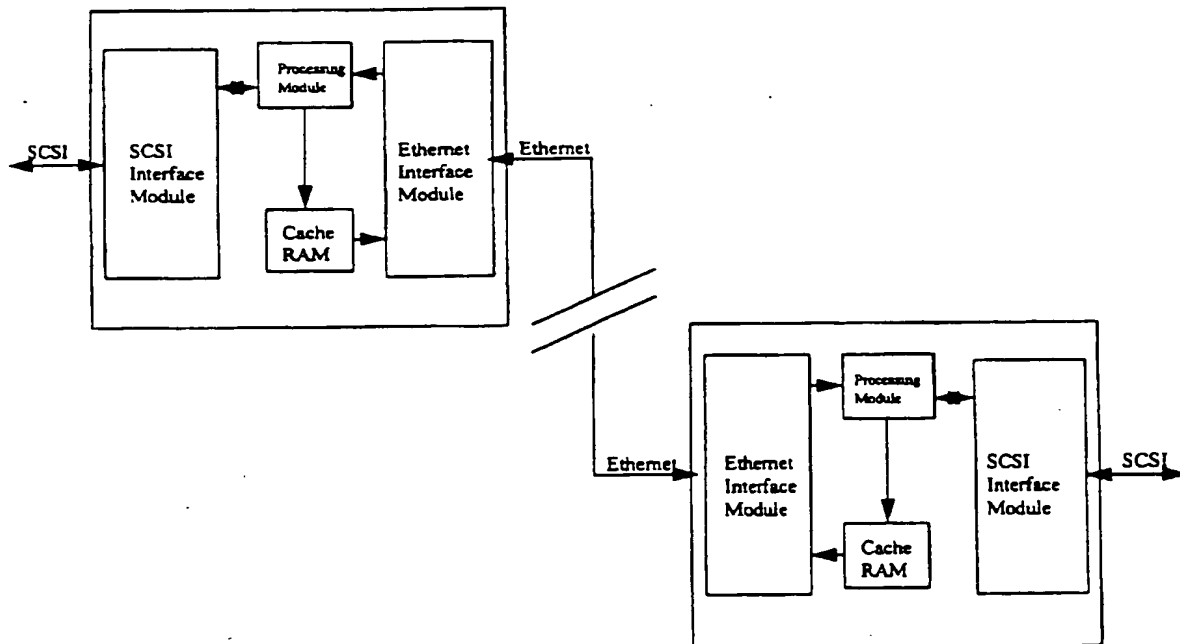


figure 2 - Generic Installation Schematic

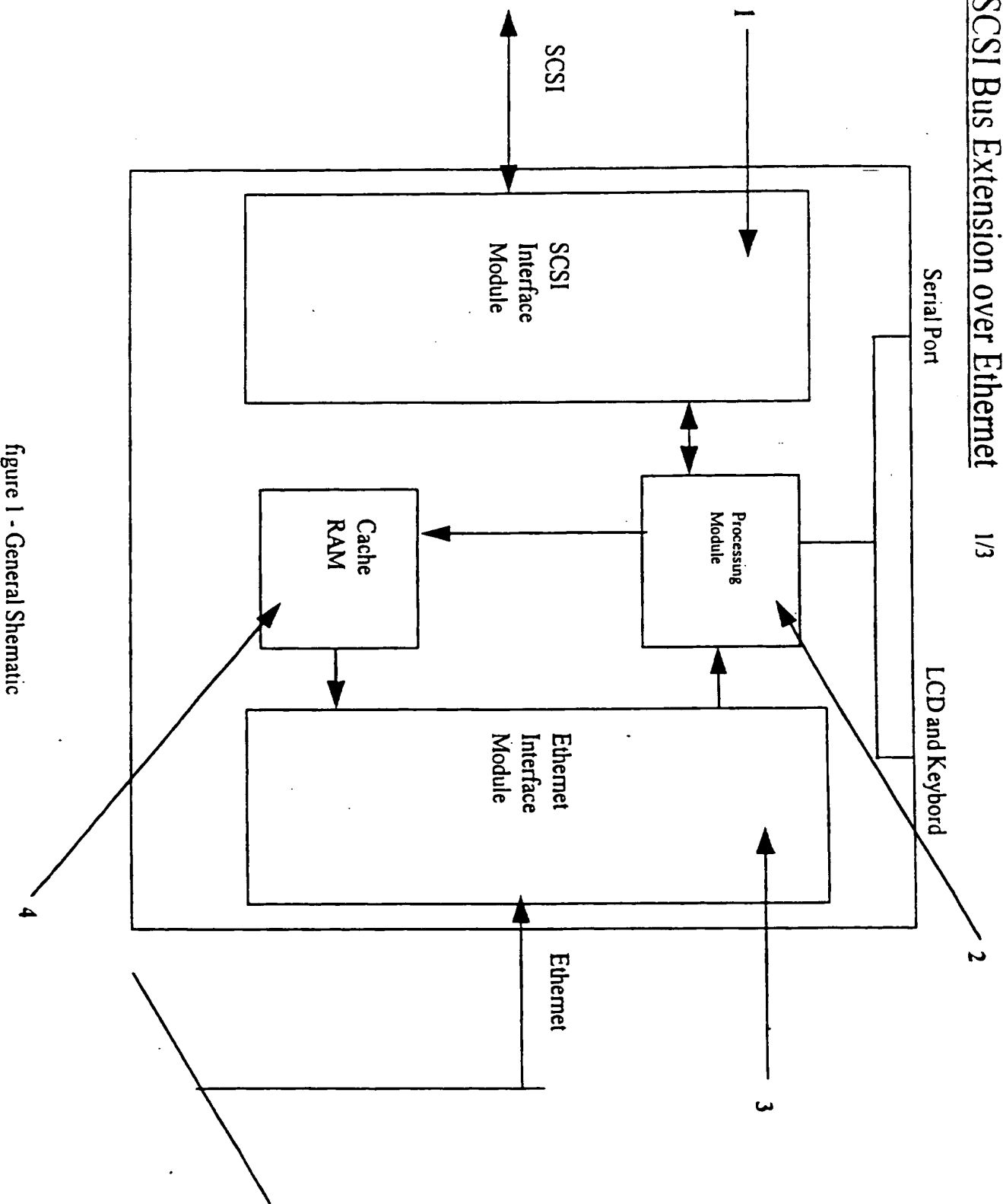


figure 1 - General Schematic

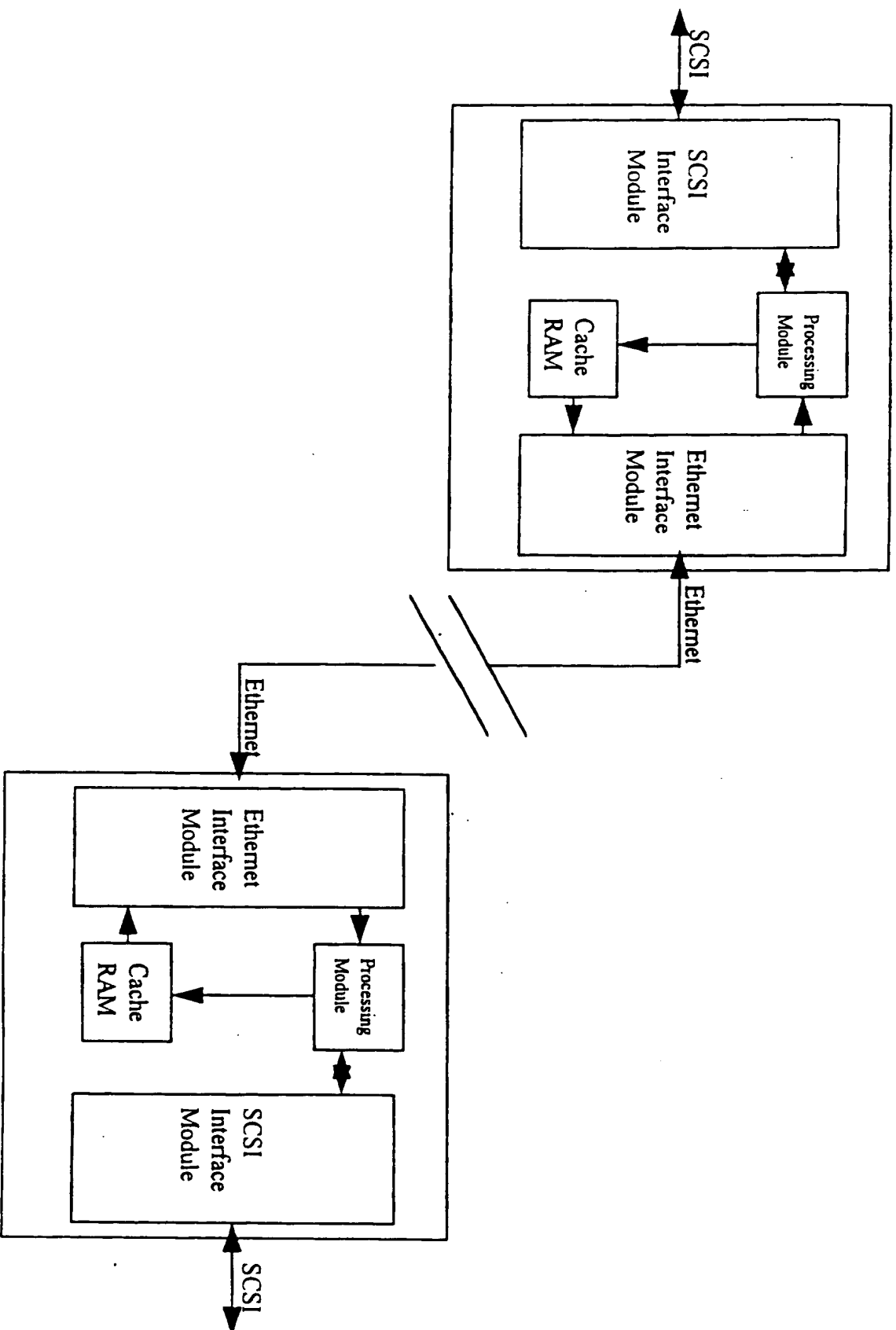


figure 2 - Generic Installation Schematic

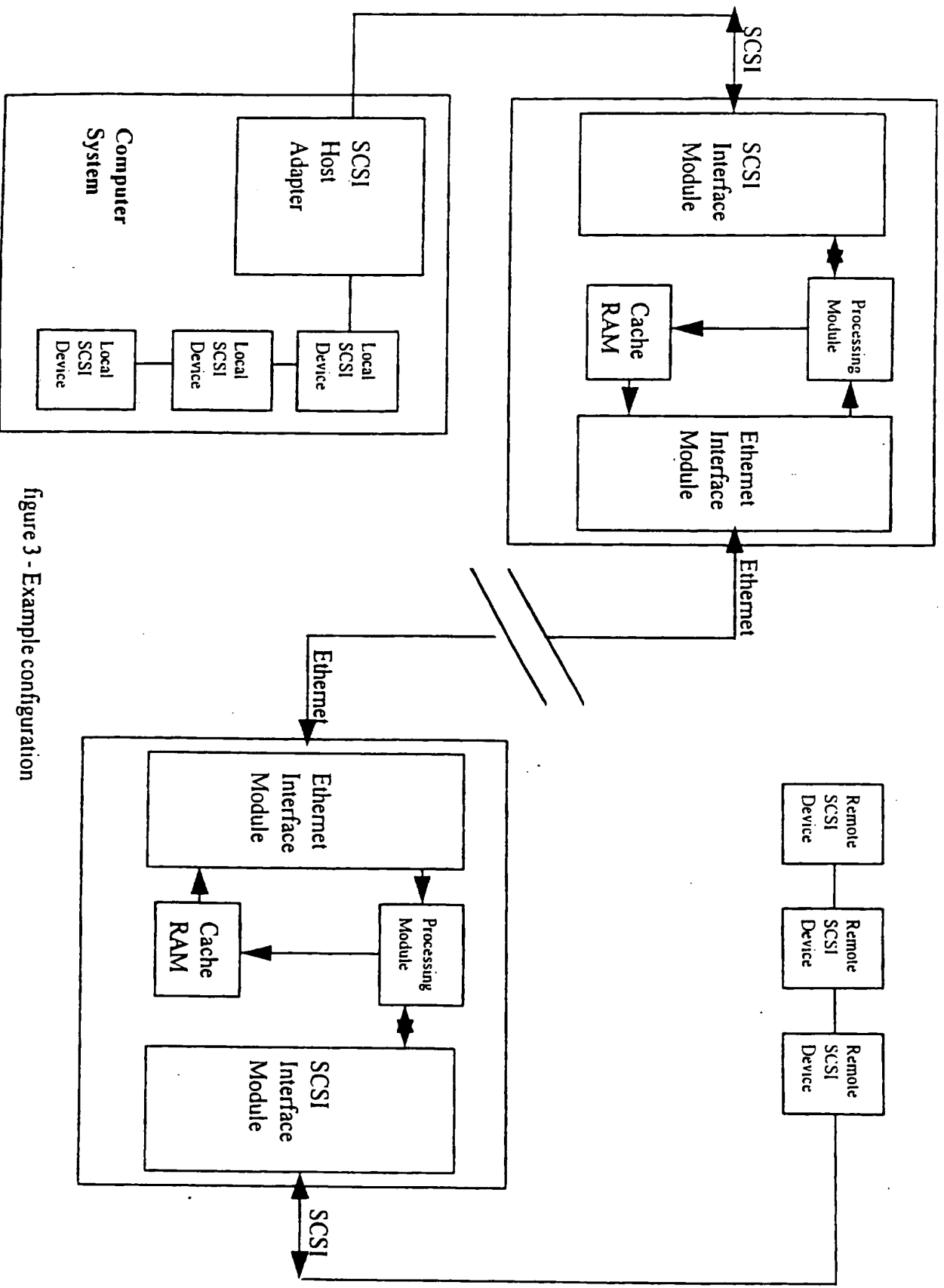


figure 3 - Example configuration

SCSI Bus extension over Ethernet

This invention relates to an electronic device comprising of a SCSI Interface Module, cache RAM, Processing Module and an Ethernet Interface Module to allow the transmission of SCSI commands and data over an Ethernet link.

Standard SCSI and SCSI II bus specifications indicate a maximum bus cable length of eighteen feet. This restriction limits the placement of remote devices which are connected to the SCSI bus. Remote devices include single SCSI devices to a complete secondary system which may or may not be active at the same time as the primary system. The joining of systems and devices using SCSI is a standard function intrinsic within the SCSI protocol. Devices and systems are mirrored for resilience and that resilience may be compromised, particularly in the case of flood, fire, theft and similar occurrences, if the mirrored devices or systems are required to be closely coupled to the primary system or device. By extending the SCSI bus over Ethernet shared devices and systems, or mirrored devices can be situated at any distance from the primary device or system by using any transport which supports Ethernet bridges and protocols.

The units operate in pairs, one local and one remote, and requires at least one SCSI host adapter to be installed on the bus. Unit identification is via standard Ethernet IP addressing which is user configurable for each unit. The local unit reads information from the SCSI bus and then re-transmit these commands and data as Ethernet packets across an Ethernet network. Only information relative to the remote devices is transmitted across the network. The remote device reads the data packets and converts them back into SCSI commands. Both units are bi-directional i.e. capable of both receiving and sending data.

The units support SCSI and SCSI II single ended protocols.

Disconnect/Reconnect commands are implemented in conjunction with SCSI arbitration.

The SCSI data is buffered before transmission on the Ethernet to maximise the throughput of the Ethernet. If this buffer becomes full the SCSI bus operation will be stopped until space becomes available in the buffer to ensure no data is lost. If the buffer does not empty the unit can be disabled or disconnected to allow the host system to continue.

The buffer memory is made up using dynamic RAM. Each unit can be configured with up to 64 Mbytes of memory which take the form of standard 72 pin SIMMS with a minimum access speed of 70ns.

The standard protocols are used, where necessary, to format the data. Remote network addresses are used on the Ethernet data packets.

The remote network address is used to learn the MAC address of the remote unit allowing automatic setup of the network.

To ensure data integrity a secondary checksum is added to all messages sent over the Ethernet. Each message also includes an incrementing message number and acknowledgments are sent after every ten messages.

The use of the secondary checksum allows the unit to test the network for any fault conditions and run above the fault detection provided by the Ethernet system and protocols.

The user is advised of network problems via the LCD display or optionally via a VDU connected to the units serial port. A buzzer will optionally sound in the event of a complete network failure.

The units are configured via a keypad and LCD or optionally via a VDU connected to the units serial port. The items which require to be set up by the user are :-

- Ethernet interface protocol
- Local Network Address
- Remote Network Addresses
- SCSI Level of Host Adapter(s)
- Remote SCSI addresses
- Unit's SCSI address
- Buzzer function on/off

The units support both 10baseT and 100baseT Ethernet interfaces and is user configurable.

Each unit is self contained with its own integral power supply, fuse and mains filter.

The unit is totally independent and operates with any system/device and operating system which supports standard SCSI and SCSI II protocols and is user configurable.

A specific embodiment of the invention will now be described by way of an example with reference to the accompanying drawings in which :-

Figure 1 illustrates the general schematic identifying the main components of each unit

Figure 2 shows two units as they would be installed

Figure 3 shows an example configuration

A host computer with a number of locally installed devices is able to access remote devices via the SCSI Bus Extension units. The local unit accepts information from the computers SCSI host adapter through its SCSI Interface Module (1) and passes commands and data to the remote devices, as necessary, via the Ethernet interface module (3) to the network. The remote unit takes the Ethernet information and converts it back into SCSI format for onward communication to the remote SCSI devices. If information is requested from the remote device, i.e a read instruction, the process is reversed.

Claims

- 1 An electronic device comprising of a SCSI Interface Module, cache RAM, Processing Module and an Ethernet Interface Module to allow the transmission of SCSI commands and data over an Ethernet link.**
- 2 A unit as claimed in Claim 1 wherein configuration utilities and status information are available via a keypad and LCD module built in to the device**
- 3 A unit as claimed in Claim 1 and 2 wherein configuration utilities and status information are available via a VDU connected to the serial port built in to the device.**
- 4 A unit as claimed in Claim 1 wherein an audible alarm will be activated in the device if the network connection fails in its entirety.**
- 5 A unit as claimed in Claim 1 wherein the SCSI Interface Module accepts SCSI and SCSI II command sets.**
- 6 A unit as claimed in Claim 1 wherein the Ethernet Interface module can operate at 10BaseT or 100BaseT protocols.**
- 7 A unit as claimed in Claim 1 and 5 wherein the SCSI or SCSI II protocol is user selectable.**
- 8 A unit as claimed in Claim 1 and 6 wherein the Ethernet protocol is user selectable.**
- 9 A SCSI bus extension device substantially as described herein with reference to figures 1-4 of the accompanying drawings.**

Amendments to the claims have been filed as follows

- 1 An electronic device comprising of a SCSI Interface Module, cache RAM, Processing Module and an Network Interface Module to allow the transmission of SCSI commands and data over a network link.
- 2 A unit as claimed in Claim 1 wherein configuration utilities and status information are available via a keypad and LCD module built in to the device
- 3 A unit as claimed in Claim 1 and 2 wherein configuration utilities and status information are available via a VDU connected to the serial port built in to the device.
- 4 A unit as claimed in Claim 1 wherein an audible alarm will be activated in the device if the network connection fails in its entirety.
- 5 A unit as claimed in Claim 1 wherein the SCSI Interface Module accepts SCSI and SCSI II command sets.
- 6 A unit as claimed in Claim 1 wherein the Network Interface module can operate at 10Mbit or 100Mbit protocols.
- 7 A unit as claimed in Claim 1 and 5 wherein the SCSI or SCSI II protocol is user selectable.
- 8 A unit as claimed in Claim 1 and 6 wherein the network protocol is user selectable.
- 9 A SCSI bus extension device substantially as described herein with reference to figures 1-4 of the accompanying drawings.



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Claims searched: All

Examiner: Mr Matthew Gillard
Date of search: 13 March 1996

Patents Act 1977
Search Report under Section 17

Databases searched:

UK Patent Office collections, including GB, EP, WO & US patent specifications, in:

UK Cl (Ed.O): G4A AFGDC; H4P PPEC

Int Cl (Ed.6): G06F 13/38, 13/40; H04L 12/413

Other: Online: WPI, INSPEC, COMPUTER

Documents considered to be relevant:

| Category | Identity of document and relevant passage | Relevant to claims |
|----------|--|--------------------|
| X | EP 0599705 A1 BULL. See abstract. | 1 at least |
| X | EP 0540001 A1 HEWLETT PACKARD. See figures 1 and 2. | 1 at least |
| X | EP 0395416 A2 DUBNER. See whole document. | 1 at least |
| X | EP 0330044 A1 SIEMENS. See abstract. | 1 at least |
| X | US 5206946 SAND TECHNOLOGY SYSTEMS. See whole document. | 1 at least |

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| X | Document indicating lack of novelty or inventive step | A | Document indicating technological background and/or state of the art. |
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